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GENERAL BACKGROUND - WS-117L

The concept for using a satellite as a platform for reconnaissance equipment was a natural outgrowth of the requirement for obtaining intelligence information of a potential enemy whose area and security precludes the effective collection of this information by ordinary aerial reconnaissance or other usual means. The need for timely and continuous intelligence information, to assess a potential enemy's capabilities and probable intent, has become more critical as the advancement of technology has produced offensive weapons with intercontinental range and greater destructive powers. The impetus which motivated the military establishment to foster work on new methods for collection of intelligence information came from the realization that current, reliable, prehostilities intelligence information is required to insure proper direction of national planning in the development of effective counterforce weapons and counterforce strategy.

The results of the numerous studies conducted since 1946, at the direction of the Department of Defense, established that a Satellite Intelligence System was feasible and would satisfy to a great extent the requirements for intelligence information to aid the national planners in making decisions.

The concept of the Advanced Reconnaissance System is a result of studies conducted at the Rand Corporation. A study completed in 1947, together with similar investigations by other contractors, concluded that a satellite vehicle was feasible as a reconnaissance vehicle but not as a weapons carrier. In 1950, the Research and Development Board vested satellite custody in the Air Force, and Rand was directed to explore its possible military utility.

Recommendations for an expanded study of reconnaissance applications were made to the Air Staff in late 1950, and a formal report (Rand-217) followed in April 1951. Feasibility studies for critical subsystems initiated at the time were television (RCA), attitude control (North American Aviation), and nuclear auxiliary power units (Bendix Aviation, Frederick Flader, Allis-Chalmers and Virto Corporation).

Recommendations for the ARS development were made by Rand in November 1953, and these were followed by a final report (Rand-262) in February 1954. Subsequently, the Air Force issued System Requirement No.5, dated 27 November 1954, later revised on 17 October 1955, and General Operational Requirement No. 80 (SA-2C), dated 16 March 1955. In the spring of 1955, design study proposals were solicited by the Air Force from selected contractors.

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The number of sources solicited was limited by the Government's desire to maintain a secure program throughout the design and development phase. The WS 117L is a reconnaissance system involving the launching of a vehicle into orbit for the ultimate purpose of collection and dissemination of intelligence information. Therefore, the problem of providing an airframe and engines did not need to be the sole guide to the type of contractors solicited. Those solicited were the Lockheed Aircraft Corp., the Radio Corporation of America, Glenn L. Martin Company, and Bell Telephone Laboratories. Bell Telephone Laboratories declined to submit a proposal.

The three contractors conducted their design studies between June 1955 and March 1956. These design studies culminated in three separate and distinct development plans. The Lockheed proposal was considered to meet the requirements most satisfactorily.

An ARDC System Development Directive No. 117L was issued on 17 August 1956. The development and test of WS 117L was awarded the Lockheed Aircraft Corp. on Contract AF 04(647)-97 in October 1956. The Massachusetts Institute of Technology was awarded the contract for research and development of the WS 117L Guidance and Orbital Attitude Control Equipment on Contract AF 04(647)-103 in November 1956. Executive management of the project is the responsibility of AFBMD.

By decision of the Secretary of Defense, 1 November 1957, the directive was issued to proceed with the WS 117L at the maximum rate consistent with good management.

The primary objective, established by the USAF's General Operationa Requirement for WS 117L, was to "provide continuous (visual, electronic or other) coverage of the U.S.S.R. and satellite nations for surveillanc purposes." In its capacity as Prime Weapon System Contractor, operatin under the direction of AFBMD, Lockheed initiated a broad program of research and development to meet this objective: the program included both visual and electronic reconnaissance systems.

On 30 June 1958, the Advanced Research Projects Agency (ARPA) Order No. 9-58 was issued confirming previous Department of Defense directives for the assumption of responsibility by ARPA for the Advanced Reconnaissance Satellite Development Program. This directive established the Director, ARPA, as the source of policy and technical guidance for futur WS 117L development.

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BACKGROUND - SAMOS

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General Operational Requirement No. 80 was revised on 26 September 1958, placing additional requirements upon the Weapon System. Two (2) significant additions included in the revised GOR 80 were the requirements for a recoverable satellite for intelligence use and a mapping and charting addendum to the GOR.

On 1 December 1958 the ARPA proposed, in a memorandum report, a reorientation of the WS 117L program. This proposal was directed to The Under Secretary of the Air Force in a memorandum on 5 December 1958. The reorientation was generated as the result of the ARPA being provided with the consolidated SAMOS intelligence requirements by the Air Force (ACS/I).

As the result of the reorientation directives of early December, AFBMD presented a briefing to the ARPA on 15 December which included an analysis of the ARPA proposed program and an AFBMD counter proposal. The results of the briefing and subsequent negotiations culminated in an ARPA memorandum to The Under Secretary of the Air Force, dated 17 December 1958. The 30 January 1959 Development Plan reflected the instructions of the 17 December 1958 memorandum with regard to program structure and technical objectives. Further, the 30 January plan provided for the development of a SAMOS Reconnaissance System which possessed the capability to satisfy the SAMOS intelligence requirements.

By Amendment No. 11 to ARPA Order No. 9-58, dated 14 April 1959, the ARPA announced qualified approval of the 30 January 1959 SAMOS Development and Funding Plan.

On 27 April 1959 the ARPA was briefed at AFBMD on the analysis and planning for new work for the SAMOS reoriented program. In late May 1959, AFBMD was notified by Headquarters ARDC (TWX RDZGW 26-5-43-E, dated 26 May 1959) that the ARPA approval of the 30 January SAMOS Development Plan did not include approval of the SAMOS recoverable mapping payload. In compliance with this directive instructions were issued to the contractor to terminate all work related to the development of a SAMOS mapping capability.

In late June, instructions were received from the ARPA (TWX 961412, dated 24 June 1959) to defer work on the SAMOS recovery program pending an ARPA program review. The reason for the deferral by the ARPA was fund limitations due to the demands of other programs. This deferral action by the ARPA will possibly delay the SAMOS system capability needed to satisfy the vital intelligence requirements of the Air Force.

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On 4 September 1959 ARPA directed that AFBMD proceed with contract negotiations that deferred the recovery costs but protected certain long lead time items, such as the E-5 camera, under a fund ceiling of [redacted]

On 9 September 1959 ARPA directed that AFBMD negotiate a program containing the High Resolution Recovery package and instructed that AFBMD was to reduce the readout program[redacted] accomplish this goal. A new funding auth[redacted] for FY 60 and a planning level o[redacted]ompanied this directive.

In a memorandum to the Chairman, Joint Chief of Staff, subject: Coordination of Satellite and Space Vehicle Operations; dated 18 September 1959 the Secretary of Defense approved specific assignments to the Air Force of the interim satellite early warning system, MIDAS, and Phase I of the satellite reconnaissance system, SAMOS. The date of transfer of these systems from the Advanced Research Projects Agency (ARPA) to the Air Force would be subject to the approval of the Secretary of Defense. The Secretary announced that prior to assuming responsibility for a specific program, the appropriate military department would submit to the Secretary for approval detailed plans for the system including our relationship with Unified and Specified Commands and other appropriate agencies.

On 23 October 1959, General LeMay in a letter to General Schriever concerning SAMOS and MIDAS, advised General Schriever that th[redacted] SAMOS would be $159.5 million dollars in FY 60[redacted] in FY 61 instead of the previously requested [redacted]

In compliance with the instructions of the Secretary of Defense on 18 September 1959, Hq USAF (AFDAT) issued instructions and guidance on 21 October 1959 which included the preparation of the necessary plans by appropriate commands for the transfer of SAMOS to the Air Force. The required plans and responsible commands were: Research and Development Plan, ARDC; Operational Plan, SAC; and Logistic Support Plan, AMC. The time scale for submission of these plans to Hq USAF was 23 November 1959, and reaffirmed the ARPA SAMOS funding ceiling f[redacted] follows: FY 60, $159[redacted]; FY 61, [redacted] plus some part of [redacted] Air [redacted] between SAMOS and [redacted].

A reclama on the effect of the above funding ceilings on the SAMOS development and operational programs was made by AFBMD on 17 November 1959. In this reclama AFBMD requested permission to present the development plans then in preparation which were the result of an extensive planning effort based on all planning guidance except that contained in the Hq USAF message of 13 November 1959. It was noted by AFBMD that the plans proposed for presentation would not be within the announced funding ceilings.

On 20 November 1959, Hq USAF reaffirmed the 13 November 1959 instructions and stated that the Development plans to be presented on 16 December 1959 would be consistent with funding ceilings; however, AFBMD could present as an additional agenda item a recommended program that exceeded the funding ceiling.

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On 21 December 1959, Hq USAF, after receiving guidance from the AFBMC, provided instructions to the AFBMD to prepare a revised development plan in [redacted] million, MCP [redacted] Additional fu [redacted] internal Air Force reprogramming action. The SAMOS program should emphasize photo over ferret and should press for earliest flight demonstration of both readout and recovery.

Presentation to DDR&E of Air Force approved plans for this program for FY 60 and FY 61 is scheduled for 15 February 1960.

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BACKGROUND - MIDAS

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The possibility of accomplishing useful reconnaissance with satellite-borne infrared sensing equipment was recognized during the early design study of the Air Force Advanced Reconnaissance System, WS 117L. A proposal to this effect was included in LMSD-1536, Pied Piper Development Plan dated 1 March 1956, under Contract AF 33(616)-3105. The approach outlined in this report was in consonance with the general system development requirements which established the WS 117L Program.

Subsequently, a prime contractor was selected by the U. S. Air Force for the WS 117L Development Program. This work was undertaken under Contract AF 04(647)-97, supplemented by Letter Contract AF 04(647)-181. Under the terms of these contracts, the prime contractor was directed to conduct a program of research and development designed to accomplish satellite-borne reconnaissance using each of three payload systems: visual, ferret and infrared. Initial work in the infrared field was conducted as an integral part of the WS 117L development.

To meet the requirements of the contract, a complex of subcontractors was organized to assist the prime contractor in determining the feasibility and to establish the preliminary design of an experimental ICBM early warning system.

As a result of significant progress in this development program, the feasibility and the technical basis for a satellite-borne attack alarm system were presented in WS 117L Subsystem G Engineering Analysis Report, Attack Alarm System, dated 19 May 1958. On 5 November 1958 the ARPA published Order No. 38-59 which separated the Infrared Reconnaissance Development (Subsystem "G") from the basic SAMOS Program and established the Infrared Development as the Missile Defense Alarm System (MIDAS). An Air Force Space System Development Plan for the MIDAS Program was prepared in January 1959. This plan, submitted in accordance with ARPA Order No. 38-59 and USAF General Operational Requirement 80-3 and 80-3A, provided for the acceleration and expansion of WS 117L infrared reconnaissance development into the Missile Defense Alarm System. The system, as conceived, utilized a network of twenty (20) satellites on random orbits at a minimum altitude of 1000 nautical miles.

A paramount consideration of this development plan was to utilize a reasonable and conservative approach to the various problems involved in the MIDAS system. This approach in turn led to a number of initial design decisions, the basis of which was to minimize the number of required modifications to developments under way in concurrent WS 117L programs, as well as to minimize the number of uncertainties which would influence the over-all design.

It was, however, a basic premise of the development plan that continued system analysis, design, and measurement efforts would be made

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to amplify these initial design decisions. The results of these efforts indicate that the orbit altitude can be increased to approximately 2000 nautical miles. The area observable by an individual satellite increased almost two-fold. The total number of vehicles required for the network was, therefore, reduced.

Reflecting these advancements, the basic design for MIDAS (consisting of a network of 12 satellites operating on distributed polar orbits at an altitude of 2000 nautical miles) was presented in MIDAS Engineering Analysis Report in March 1959.

This system, together with the option for converting to controlled orbit operation, was evaluated by the Air Force Ballistic Missile Division in May 1959. The means of achieving orbit control appeared sufficiently sound to recommend testing orbit-control components in early MIDAS R&D flights.

Analyses have continued which further define system parameters for critical components of the MIDAS system. It has been concluded that incorporation of dual burning, increased volume propellant tanks, and orbit-control techniques in the MIDAS system should be accomplished early in the R&D program. These design features, if substantiated in the flight test program, will permit the achievement of a 2000 nautical mile orbit altitude and a reduction in the number of satellites to eight for the MIDAS network.

On 14 December 1959, the AFBMC considered the proposed MIDAS development plan consisting of 10 flights beginning in February 1960. As a result of this, Hq USAF instructed AFBMD to prepare a development plan based on the funds available in FY 60 and FY 61. (FY 60, P-600 $46.9 million, MCP $12.8 million, and FY 61, P-600 $81.0 million, MCP $11.0 million) In the plan heavy emphasis is to be placed on reliability.

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BACKGROUND - DISCOVERER

The concept for using an Earth satellite as a platform for detecting, measuring, and transmitting significant scientific data to ground-based stations was a natural outgrowth of progress here and abroad with research rockets. The need for timely and continuous scientific research utilizing instrumented rockets and Earth satellites after the close of the International Geophysical Year was also emphasized by the first conference on the International Geophysical Year held in the United States. The impetus which motivated the United States Government to support new methods for collecting otherwise unattainable scientific information was man's rapidly increasing ability to view the world as a whole. From these observations will come a vast body of geophysical data which will permit American scientists to observe all the large scale aspects of the Earth: its exterior, the lower and upper atmosphere, gravity and magnetism, and extraterrestrial features.

In January 1958, in order to accelerate the program, it was decided to augment the WS 117L program by making an interim use of the Thor booster for nine (9) flights. This would permit an early achievement of orbital capability. Subsequently, approval was granted for the use of five (5) additional Thor-boosted satellites to conduct biomedical experiments.

As the result of the Advanced Research Projects Agency (ARPA) Order No. 17-59, dated 4 September 1958 with three subsequent amendments, the program structure was established to provide for fifteen (15) ARPA funded flights.

ARPA Order No. 48-59, dated 16 December 1958 confirmed previous instructions to identify this program as DISCOVERER: thus, separating this development from the over-all WS 117L program structure. A Discoverer Development Plan, dated 30 January 1959, providing for a fifteen (15) vehicle program was prepared and submitted for ARPA approval.

The 30 January 1959 Discoverer Plan was approved for a Thirteen (13) vehicle program by Amendment No. 2 to ARPA Order 48-59, dated 24 March 1959.

In compliance with USAF message, AFDAT 59353, dated 27 April 1959, a new Discoverer Development Plan, dated 30 April 1959, calling for a twenty-five (25) vehicle program was prepared and submitted to the ARPA for approval. The 25-vehicle program was approved by Amendment No. 4 to ARPA Order 48-99, dated 20 May 1959.

Amendment No. 6 to ARPA Order 48-60, dated 20 July 1959, increased the Discoverer Program from a 25-vehicle series to a 29-vehicle series. This Amendment included instructions to submit a revised Development and Funding Plan to reflect the program increase.

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As the result of Department of Defense programming actions the Discoverer Program was transferred from the ARPA to USAF cognizance on 17 November 1959.

On 21 December 1959, Hq USAF, after receiving guidance from the AFBMC, provided instructions to the AFBMD to prepare a revised development plan for the full 29-vehicle program reflecting the full cost through FY 60 and FY 61 to complete the program.

Twenty (20) flights remain in the program. Presentation to DDR&E of Air Force approved plans for this program for FY 60 and FY 61 is scheduled for 15 February 1960.